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ABSTRACT

The future effectiveness of trade and industrial (T&I) education programs can be increased by reforms in teacher education, collaboration with national support agencies, and taking advantage of technological and instructional advances. Among the important teacher education reforms are the following: (1) teacher preparation should include liberal arts studies and academic skills; (2) certification levels and work assignments should recognize the difference in teachers' knowledge, skill, and commitment; (3) a differentiated staffing pattern should be established and include master and lead teachers; (4) teacher preparation should include study of the subjects they will teach, under the tutelage of instructors who are effective teaching models and who understand the pedagogy related to those studies; (5) generic education courses should be replaced with studies of teaching and learning that are subject-matter oriented; and (6) special teacher recruitment and retraining efforts should be aimed at ethnic and racial minority groups. Collaboration with national support groups should include relationships with the American Association for Vocational Instructional Materials and the Vocational-Technical Education Consortium of the States. Among the technical and instructional advances that should be utilized are computer-based competency modules, video teleconferencing, occupational competency testing; vocational education competency achievement tracking system, and computerized competency/test-item bank. (CML)

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Trade and Industrial Education: Visions of the Future

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Trade and Industrial Education: Visions of the Future

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Seventy-two years ago, two Congressman from Georgia, Representative Dudley Hughes and Senator Hoke Smith wrote federal legislation (Public Law 64-347) to design vocational education as an essential component of the total public education process, under the development and supervision of a state plan. Specifically, the state plan is an official contract between a state board for vocational education and a local education agency under which any service or phase of the vocational education program within the state is to operate if state and federal vocational funds are to be used in reimbursing a local board of education for a part of its cost of conducting the program.

The need for vocational education is just as severe today as it was during 1917 to promote the general welfare of the United States by providing technical training for those persons in school and those in the work force. During the past seven decades trade & industrial (T&I) education has served as a beacon of hope and panacea for the economic woes of America (Farmer, 1987). In fact, the demand for T&I teachers is likely to increase in the next decade and beyond as the private sector, educators, and the public recognize

the growing importance of programs in meeting the individual's and society's needs. However, recognition of the importance of T&I programs in economic development and employment will necessitate T&I personnel to evaluate the adequacy, quality and effectiveness of their programs in relation to educational and societal outcomes (Greenan, 1989).

Some interesting results were revealed from the Seventh Annual Trade-Industrial Teacher Supply and Demand survey of the 50 state supervisors, conducted to identify and report expected needs and shortages of T&I teachers during the 1988-89 school year. The survey revealed that there is a continuous and relatively high need for T&I teachers. The overall expected need has increased (1,838) sharply from the 1987-88 survey (1,114). The expected shortages have decreased (83) slightly from last year's survey (93). Program needs and shortages appear to be specific to individual states as shown in Table 1.

Contrary to the supply and demand of T&I teachers is the educational needs and demand for skill workers. According to Frederick G. Welch (1989), by the year 2000 it is estimated that 5 to 15 manufacturing jobs will require different skills than are presently required, and that small companies with less than 100 employees each will offer the bulk of new job opportunities. He further stated that more than 50 percent of all jobs will require education or technical training beyond high school as shown in Table 2.

Purpose

The purpose of this paper is to present future directions for Trade & Industrial Education to T&I teachers and administrators in an effort to assist them in updating and revising their instructional programs. However, before we gaze into the future, it is essential that we are very knowledgeable about what has occurred in the past. Otherwise the results of our efforts, to "re-invent the wheel," will be counter-productive.

As T&I educators, it is essential that we have a complete understanding of the foundation and conceptual framework of our profession before we start gazing into the future. Moreover, most educators do not believe that our profession has a theoretical base like other academic disciplines. However, contrary to those beliefs, the two distinguished Congressmen from Georgia's conceived method of educating and training youth, to meet the needs of industry in a changing world, had a conceptual theory for vocational education. They conceptualized that "trained intelligence" is developmental and given the proper instruction, resources, and time, individuals can achieve useful employment (Farmer, 1986) and (Farmer & Burrow, 1989).

The conceptual theory of vocational education, as noted by Smith-Hughes, is validated by Webster's formal definition of theory-- "a speculative idea or plan as to how something might be done." A careful review of the Congressional Records verifies that the Smith-Hughes Act was based upon the

theory that every occupation may be so filled as to reflect intelligent guidance (P.L. 64-347, 1917).

Forecasting

As an industrial teacher educator, there are twelve vital applications of reform that must occur in the future in order to increase the effectiveness of trade and industrial education program.

1. Trade and industrial teachers should have a sound intellectual base including a strong preparation in the liberal studies and academic skills.
2. Differences in the knowledge, skill, and commitment of T&I teachers should be recognized in both work assignment and certification levels.
3. Standards of entry into trade and industrial education teaching should include educational requirements and professional testing that are intellectually challenging and relevant to the specific requirements of vocational education teaching.
4. A differentiated staffing pattern of trade and industrial education teachers should be established to include master and lead T&I teachers
5. The trade and industrial teacher education preparation curriculum should allow T&I students to study the subjects they will teach with instructors who are effective teaching models and who undertand the pedagogy related to those subjects.
6. The T&I curriculum should include significant study of

the content which will be taught with generic education courses replaced by subject matter oriented studies of teaching and learning.

7. Trade and industrial education teachers should meet the common standards established by a national teacher certification board and the additional specific requirements unique to the profession.
8. Lead teachers in trade and industrial education should provide leadership in teaching and learning for their T&I colleagues within the entire school and their local education regions.
9. Efforts to prepare the most qualified persons for T&I teaching should include special attention to recruiting and retraining persons from ethnic and racial minority groups.
10. Provide incentives for T&I teachers based on school-wide student performance measures related to important educational outcomes.
11. Provide a supportive teaching and learning environment including appropriate technology, facilities, services, and support staff essential for T&I faculty and students' productivity.
12. Make the compensation and working conditions of T&I teachers consistent with that of other teachers and competitive with comparable positions for which they are qualified in business and industry.

Agenda Items for the Year 2000

Trade and industrial education programs must respond to the immediate, as well as the future, needs of T&I teachers, students and society. Keeping that thought in mind, following is a list of ten items that I perceive as impact items for future trade and industrial education programs: 1) computer numerical control (CNC) and computer aided design/computer aided manufacturing (CAD/CAM), 2) comuter-based competency modules (CBCM), 3) occupational competency testing, 4) cluster curriculum, 5) videodisc and video teleconferencing, 6) alternative delivery of credentialing T&I teachers, 7) leadership and teacher effectiveness training, 8) the "at risk" student, 9) vocational education competency achievement tracking system (VoCATS), and 10) computerized computency/test-item bank (C/TIBs).

Trade and Industrial educators may be familar with some of these agenda item; therefore, I will only discuss some of the areas such as computer-based competency modules, video disc and video teleconferencing, occupational competency testing, vocational education competency achievement tracking system (VoCATS), and computerized competency/test-item bank (C/TIBs).

Computer-Based Competency Modules (CBCM). Performance-Based Teacher Education (PBTE) modules have been used for over two decades in vocational industrial education, but the computerized version is a new concept. Each module is designed to integrate theory and practice with terminal

objectives that use criterion referenced assessment. The modules are grouped within 13 categories of teacher performance: 1) program planning, development, and evaluation; 2) instructional planning, 3) instructional execution, 4) instructional evaluation, 5) instructional management, 6) guidance, 7) school-community relations, 8) vocational student organizations, 9) professional role and development, 10) coordination of cooperative education, 11) implementing competency-based education, 12) serving students with special/exceptional needs, and 13) assisting students in improving their basic skills.

Developing a computerized version of the 'PBTE' modules will allow flexible delivery of the curriculum so T&I teachers can efficiently develop critical competencies for effective teaching. In an actual classroom setting, advantages of CBCM would be: 1) the capacity for making quick diagnostic and prescriptive instructional decisions; 2) to alert students when making wrong decisions, so they will get appropriate feedback about the consequences without the dangers and costs associated with actual conditions; 3) an interactive or question-feedback sequence providing user alternatives; 4) instructional management systems providing data on the progress of individual learners, and 5) to allow effective time management for both instructor and learner.

Video disc and Video Teleconferencing. Video disc and video teleconferencing have become integral components of corporate training. In 1986, more than 8,000 companies and

other organizations spent $2.3 billon to produce video-based instruction for their employees; by 1990, the amount is expected to exceed $7 billion. The advances in computer-managed video disc technology make it an unusually flexible and effective instructional resource. Video conferencing through satellite delivery allows interactive instruction in a variety of locations.

Video technologies are being increasingly used in education and can become an important function in the delivery of trade and industrial education. The use will allow flexibility of delivery and individualization of instruction. Video formats are effective in remediation and review as well as providing opportunities for learners to videotape performance for self-review and critique and for competency evaluation.

Occupational Competency Testing. Teacher certification through competency testing will need to be extended to all T&I areas and across the range of vocational industrial education. An appropriate competency testing procedure, developed and administered by a national certification board is necessary to verify the effectiveness of trade and industrial education programs.

Effective competency testing provides the opportunity to meet an essential need of non-traditional teachers entering trade and industrial education without a baccaulaureate degree. Teacher education institutions will have to articulate with state and local school boards more in order

to award appropriate academic credits for successfully completing the occupational competency examination.

Vocational Education Competency Achievement Tracking System (VoCATS). This innovative program can follow students through their entire vocational course of study, measuring their perforance levels at various intervals during the school year. The VoCATS system developed in North Carolina, produces, administers, scores and analyzes pre- and post-test for specific vocational courses. The system is based on competencies, skills and attitudes that students must be able to understand, explain, demonstrate or apply upon completion of specific learning activities. VoCATS sets the stage for computer-managed, individualized programs without the time and paperwork required by similiar proposed programs.

Computerized Competency/Test-Item Banks (C/TIBs). This is a state of-the-art system, now implemented in North Carolina. The C/TIBs have been prepared for 40 vocational courses identified in the basic education program's course of study. This system will undoubtedly be an asset to T&I teachers, administrators, and vocational counselors. The C/TIBs system can also be customized to generate data on student learning for use in T&I program review, state accreditation, and to inform the community of successful activities regarding trade and industrial education.

Conclusion

Curriculum revision is a necessity for trade and industrial education programs in order to increase the effectiveness of preparing students and teachers with the state of-the-art in pedagogy and technical competencies. Vocational administrators need to revise their T&I programs to include three major areas: 1) social content, 2) intellectual content, and 3) technical content. These content areas are synonymous to the three educational domains: affective, cognitive, and psychomotor respectively.

Trade and industrial education programs should develop a core curriculum to include more courses in liberal arts. However, the future of the profession, to a great extent, depends, on how well T&I leaders articulate and collaborate with external support agencies such as: 1) National Center for Research in Vocational Education, 2) Vocational Technical Education Consortium of States (V-TEC), National Advisory Council on Vocational Education, 3) Vocational Education Information Management (VEIMS), 4)American Association of Vocational Instructional Material (AAVIM).

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Table 1

Expected Needs and Shortages of Trade-Industrial Teachers in the 50 States, District of Columbia, and Surrounding Territories During 1988-89

	Auto Mechanics		Electronics		Welding		Carpentry		Electricity		Drafting	
	Need	Shortage	Need	Shortage	Need	Shortage	Need	Shortage	Need	Shortage	Need	Shortage
ALABAMA	8	0	14	2	2	0	5	0	2	0	4	0
ALASKA	5	0	0	0	0	0	1	0	0	0	0	0
ARIZONA	10	0	8	0	5	0	3	0	0	0	4	0
* ARKANSAS	15	0	5	1	5	0	11	0	4	0	2	0
CALIFORNIA	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
COLORADO	5	0	5	0	0	0	3	0	0	0	3	0
CONNECTICUT	0	0	1	1	0	0	0	0	0	0	0	0
DELAWARE	0	0	0	0	0	0	0	0	0	0	0	0
D.C.	0	0	2	0	0	0	0	0	3	1	0	0
FLORIDA	11	0	7	0	4	0	2	0	2	0	10	0
GEORGIA	5	1	0	0	4	0	6	0	2	0	4	0
HAWAII	1	0	2	1	0	0	1	0	2	0	0	0
IDAHO	0	0	2	1	0	0	0	0	0	0	1	0
ILLINOIS	0	0	0	0	0	0	0	0	0	0	0	0
INDIANA	3	0	2	0	2	0	2	0	0	0	1	0
IOWA	7	0	9	0	1	0	2	0	1	0	3	0
KANSAS	0	0	0	0	0	0	0	0	0	0	0	0
KENTUCKY	10	0	4	0	2	0	5	0	2	0	2	0
LOUISIANA	0	0	0	0	0	0	0	0	0	0	0	0
MAINE	2	0	2	1	1	0	2	0	0	0	0	0
MARYLAND	0	0	0	0	0	0	0	0	0	0	0	0
* MASSACHUSETTS	10	0	5	1	4	0	8	0	4	0	5	1
* MICHIGAN	5	0	20	10	3	0	8	5	5	3	4	0
MINNESOTA	9	0	4	0	1	0	2	0	0	0	4	0
MISSISSIPPI	9	0	6	0	3	0	4	0	3	0	3	0
* MISSOURI	10	0	4	0	3	0	8	0	8	0	4	0
MONTANA	2	0	0	0	0	0	0	0	0	0	0	0
NEBRASKA	0	0	0	0	0	0	0	0	0	0	0	0
NEVADA	3	0	1	0	2	0	2	0	0	0	4	0
NEW HAMPSHIRE	0	0	0	0	0	0	0	0	0	0	0	0
* NEW JERSEY	197	0	73	7	23	0	209	0	55	0	47	2
NEW MEXICO	1	0	1	0	0	0	2	0	0	0	1	0
NEW YORK	10	0	9	0	2	0	5	0	2	0	5	0
NORTH CAROLINA	10	0	5	0	1	0	10	0	2	0	5	0
* NORTH DAKOTA	40	0	10	0	18	0	20	0	20	0	10	0
OHIO	2	0	0	0	0	0	0	0	0	0	0	0
OKLAHOMA	10	0	5	0	5	0	8	0	3	0	3	0
OREGON	2	0	0	0	0	0	0	0	0	0	1	0
PENNSYLVANIA	2	0	2	0	0	0	1	0	1	0	1	0
RHODE ISLAND	2	0	0	0	0	0	2	0	0	0	1	0
SOUTH CAROLINA	4	0	5	0	1	0	3	0	4	0	0	0
SOUTH DAKOTA	3	0	1	0	0	0	0	0	0	0	0	0
TENNESSEE	6	0	0	0	0	0	3	0	0	0	3	1
TEXAS	0	0	0	0	0	0	0	0	0	0	0	0
UTAH	4	0	2	0	1	0	0	0	0	0	1	0
VERMONT	1	0	0	0	0	0	2	0	0	0	0	0
VIRGINIA	3	0	7	2	1	0	4	2	4	2	2	0
WASHINGTON	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WEST VIRGINIA	5	0	2	0	2	0	3	0	0	0	3	0
WISCONSIN	0	0	0	0	0	0	0	0	0	0	0	0
WYOMING	0	0	0	0	0	0	0	0	0	0	0	0
GUAM	0	0	0	0	0	0	0	0	1	0	0	0
PUERTO RICO	3	3	2	0	3	0	2	0	3	3	4	0
U.S. VIRGIN I.	0	0	1	0	N/A	N/A	0	0	0	0	1	1
TOTALS	435	4	226	27	99	0	349	7	134	9	146	5

Need — number of vacant teaching positions
Shortage — projected number of teaching positions that will remain vacant
N/A — need or shortage data unavailable
Yes — need or shortage exists but data unavailable

Table 1 continued

	Machine Shop		Auto Body		Graphic Arts		Heating, Air Conditioning and Refrigeration		Totals	
	Need	Shortage	Need	Shortage	Need	Shortage	Need	Shortage	Need	Shortage
	2	0	2	0	2	0	3	0	44	2
	0	0	0	0	0	0	0	0	6	0
	1	0	0	0	1	0	0	0	30	0
*	2	0	8	0	0	0	0	0	52	1
	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
	2	0	2	0	0	0	2	0	22	0
	0	0	0	0	0	0	0	0	1	1
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	6	1
	1	0	1	0	0	0	4	0	42	0
	7	0	2	0	5	0	2	0	37	1
	0	0	0	0	0	0	N/A	N/A	6	1
	0	0	0	0	1	0	0	0	4	1
	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	12	0
	1	0	2	0	1	0	1	0	28	0
	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	1	0	28	0
	0	0	0	0	0	0	0	0	0	0
	0	0	1	0	0	0	0	0	8	1
	0	0	0	0	0	0	0	0	0	0
*	4	0	3	0	5	1	3	1	51	*
*	0	0	*	2	9	5	0	0	58	25
	2	0	0	0	2	0	0	0	24	0
	1	0	1	0	1	0	1	0	32	0
*	3	0	6	0	2	0	10	0	59	0
	0	0	0	0	1	0	0	0	3	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	13	0
	0	0	0	0	0	0	0	0	0	0
*	37	4	23	2	138	0	27	3	829	18
	1	0	0	0	0	0	0	0	6	0
	2	0	2	0	3	0	1	0	41	0
	1	0	1	0	5	0	1	0	41	0
*	2	0	5	0	2	0	13	0	140	0
	0	0	0	0	0	0	0	0	2	0
	2	0	4	0	2	0	4	0	46	0
	1	0	1	0	1	0	0	0	6	0
	0	0	2	0	2	0	1	0	12	0
	1	0	1	0	1	0	0	0	8	0
	3	1	0	0	0	0	1	0	21	1
	1	0	0	0	0	0	0	0	5	0
	0	0	7	2	0	0	0	0	19	3
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	1	0	0	0	9	0
	0	0	0	0	0	0	N/A	N/A	3	0
	3	1	3	1	1	0	1	0	29	8
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	YES	YES
	3	0	2	0	0	0	2	0	22	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	1	0
	4	4	2	2	2	0	3	0	28	12
	1	1	0	0	0	0	1	1	4	3
	92	11	85	9	190	6	82	5	1838	83

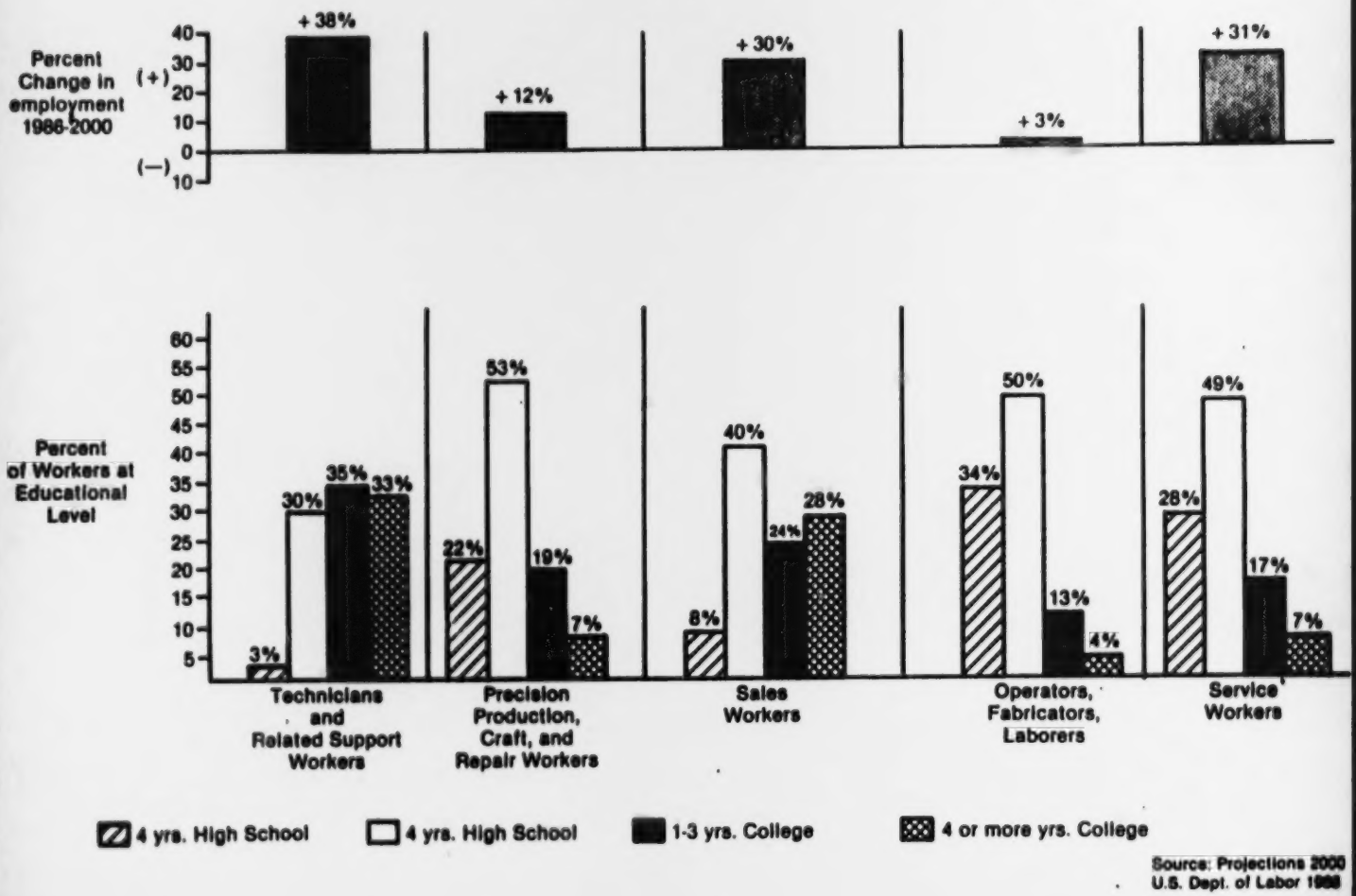
Low Demand (0 -10 T&I teachers needed)

Average Demand (11 -50 T&I teachers needed)

* High Demand (> 51 T&I teachers needed)

Table 2

EDUCATIONAL NEEDS FOR EMPLOYMENT



Source: Projections 2000
U.S. Dept. of Labor 1988